

# Claims

- [c1] In a partial stroke valve test apparatus having a housing enclosing a drive cam operably attached through a shaft to an actuator and an emergency shutdown valve, and an engagement cam attached to a cylindrical engagement shaft for selectively engaging with the drive cam during a partial stroke valve test and selectively rotated between a test position in which the engagement cam engages with the drive cam and an operational position in which the engagement cam is rotated away from the drive cam, the improvement comprising:  
a detent radially communicating with the engagement shaft for selectively maintaining the partial stroke valve test apparatus in the test position or the operational position.
- [c2] The partial stroke valve test apparatus of claim 1 and further comprising a safety release mechanism in communication with one of the engagement shaft and the engagement cam which can be selectively disengaged for rotation of the engagement cam between the test position and the operational position.
- [c3] The partial stroke valve test apparatus of claim 1 and

further comprising a key for selectively rotating the drive cam, a key lock pin mounted in the housing, and a lock pin channel comprising a portion of the key wherein the key lock pin engages the lock pin channel, thereby preventing removal of the key from the valve test apparatus when the engagement cam is in the test position.

[c4] The partial stroke valve test apparatus of claim 1 wherein the detent comprises a detent pin and a spring adapted to bias the detent pin toward the engagement shaft.

[c5] The partial stroke valve test apparatus of claim 4 wherein the detent is located at an end of the engagement shaft.

[c6] The partial stroke valve test apparatus of claim 4 wherein the engagement shaft comprises at least one seat adapted for seating of the detent pin therein.

[c7] The partial stroke valve test apparatus of claim 6 wherein the at least one seat corresponds to one of the test position and the operational position.

[c8] The partial stroke valve test apparatus of claim 2 wherein the safety release mechanism comprises a pin and a spring adapted to bias the pin toward the one of the engagement shaft and the engagement cam.

[c9] The partial stroke valve test apparatus of claim 8 wherein

the one of the engagement shaft and the engagement cam comprises a seat adapted for seating of the pin therein.

[c10] The partial stroke valve test apparatus of claim 9 wherein the pin is adapted to be seated in the seat when the engagement cam is in the operational position.

[c11] The partial stroke valve test apparatus of claim 3 wherein the key comprises a flag for indicating that the engagement cam is in the test position.

[c12] The partial stroke valve test apparatus of claim 1 and further comprising a remote operator connected to the engagement shaft, a sensor adapted to generate information in response to the rotational position of the engagement shaft, and a controller for controlling the operation of the remote operator in response to the information generated by the sensor to selectively rotate the engagement cam between the test position and the operational position.

[c13] The partial stroke valve test apparatus of claim 2 and further comprising a remote operator connected to the engagement shaft, a sensor adapted to generate information in response to the rotational position of the engagement shaft, and a controller for controlling the op-

eration of the remote operator in response to the information generated by the sensor to selectively rotate the engagement cam between the test position and the operational position.

[c14] In a partial stroke valve test apparatus having a housing enclosing a drive cam operably attached through a shaft to an actuator and an emergency shutdown valve, and an engagement cam attached to an engagement shaft for selectively engaging with the drive cam during a partial stroke valve test and selectively rotated between a test position in which the engagement cam engages with the drive cam and an operational position in which the engagement cam is rotated away from the drive cam, the improvement comprising:

a safety release mechanism in communication with one of the engagement shaft and the engagement cam which can be selectively disengaged for rotation of the engagement cam between the test position and the operational position.

[c15] The partial stroke valve test apparatus of claim 14 and further comprising a key for selectively rotating the drive cam, a key lock pin mounted in the housing, and a lock pin channel comprising a portion of the key wherein the key lock pin engages the lock pin channel thereby preventing removal of the key from the valve test apparatus

when the engagement cam is in the test position.

- [c16] The partial stroke valve test apparatus of claim 14 wherein the safety release mechanism comprises a pin and a spring adapted to bias the pin toward the one of the engagement shaft and the engagement cam.
- [c17] The partial stroke valve test apparatus of claim 16 wherein the one of the engagement shaft and the engagement cam comprises a seat adapted for seating of the pin therein.
- [c18] The partial stroke valve test apparatus of claim 17 wherein the pin is adapted to be seated in the seat when the engagement cam is in the operational position.
- [c19] The partial stroke valve test apparatus of claim 15 wherein the key comprises a flag for indicating that the engagement cam is in the test position.
- [c20] The partial stroke valve test apparatus of claim 14 and further comprising a remote operator connected to the engagement shaft, a sensor adapted to generate information in response to the rotational position of the engagement shaft, and a controller for controlling the operation of the remote operator in response to the information generated by the sensor to selectively rotate the engagement cam between the test position and the op-

erational position.

[c21] In a partial stroke valve test apparatus having a housing enclosing a drive cam operably attached through a shaft to an actuator and an emergency shutdown valve, and an engagement cam attached to an engagement shaft for selectively engaging with the drive cam during a partial stroke valve test and selectively rotated between a test position in which the engagement cam engages with the drive cam and an operational position in which the engagement cam is rotated away from the drive cam, the improvement comprising:

a key for selectively rotating the drive cam, a key lock pin mounted in the housing, and a lock pin channel comprising a portion of the key wherein the key lock pin engages the lock pin channel thereby preventing removal of the key from the valve test apparatus when the engagement cam is in the test position.

[c22] The partial stroke valve test apparatus of claim 21 wherein the key comprises a flag for indicating that the engagement cam is in the test position.

[c23] The partial stroke valve test apparatus of claim 21 and further comprising a detent at an end of the engagement shaft for selectively maintaining the partial stroke valve test apparatus in the test position or the operational po-

sition, and a safety release mechanism in communication with one of the engagement shaft and the engagement cam which can be selectively disengaged for rotation of the engagement cam between the test position and the operational position.

- [c24] The partial stroke valve test apparatus of claim 23 wherein the detent comprises a detent pin and a spring adapted to bias the pin toward the engagement shaft.
- [c25] The partial stroke valve test apparatus of claim 24 wherein the detent is located at an end of the engagement shaft.
- [c26] The partial stroke valve test apparatus of claim 24 wherein the engagement shaft comprises at least one seat adapted for seating of the detent pin therein.
- [c27] The partial stroke valve test apparatus of claim 26 wherein the at least one seat corresponds to one of the test position and the operational position.
- [c28] The partial stroke valve test apparatus of claim 23 wherein the safety release mechanism comprises a pin and a spring adapted to bias the pin toward the one of the engagement shaft and the engagement cam.
- [c29] The partial stroke valve test apparatus of claim 28

wherein the one of the engagement shaft and the engagement cam comprises a seat adapted for seating of the pin therein.

[c30] The partial stroke valve test apparatus of claim 29 wherein the pin is adapted to be seated in the seat when the engagement cam is in the operational position.

[c31] The partial stroke valve test apparatus of claim 23 wherein the key comprises a flag for indicating that the engagement cam is in the test position.

[c32] In a partial stroke valve test apparatus having a housing enclosing a drive cam operably attached through a shaft to an actuator and an emergency shutdown valve, and an engagement cam attached to a cylindrical engagement shaft for selectively engaging with the drive cam during a partial stroke valve test and selectively rotated between a test position in which the engagement cam engages with the drive cam and an operational position in which the engagement cam is rotated away from the drive cam, the improvement comprising:

a remote operator connected to the engagement shaft, a sensor adapted to generate information in response to the rotational position of the engagement shaft, and a controller for controlling the operation of the remote operator in response to the information generated by the



sensor to selectively rotate the engagement cam between the test position and the operational position.

[c33] The partial stroke valve test apparatus of claim 32 and further comprising a safety release mechanism in communication with one of the engagement shaft and the engagement cam which can be selectively disengaged for rotation of the engagement cam between the test position and the operational position.

[c34] The partial stroke valve test apparatus of claim 33 wherein the safety release mechanism comprises a pin and a spring adapted to bias the pin toward the one of the engagement shaft and the engagement cam.

[c35] The partial stroke valve test apparatus of claim 34 wherein the one of the engagement shaft and the engagement cam comprises a seat adapted for seating of the pin therein.

[c36] The partial stroke valve test apparatus of claim 35 wherein the pin is adapted to be seated in the seat when the engagement cam is in the operational position.

[c37] The partial stroke valve test apparatus of claim 32 and further comprising a detent at an end of the engagement shaft for selectively maintaining the partial stroke valve test apparatus in the test position or the operational po-

sition.

- [c38] The partial stroke valve test apparatus of claim 37 wherein the detent comprises a detent pin and a spring adapted to bias the detent pin toward the engagement shaft.
- [c39] The partial stroke valve test apparatus of claim 38 wherein the detent is located at an end of the engagement shaft.
- [c40] The partial stroke valve test apparatus of claim 38 wherein the engagement shaft comprises at least one seat adapted for seating of the detent pin therein.
- [c41] The partial stroke valve test apparatus of claim 40 wherein the at least one seat corresponds to one of the test position and the operational position.